

84. The device of claim 82 wherein said means for providing angular detention is formed of cords fastened together.

85. The device of claim 12 further comprising:
a camera and lighting positioned on said base module.

REMARKS

Drawings

Applicants submit herewith substitute Figures 1-43 and declare the same as formal drawings.

Claims

Claims 1, 12 and 14-20 are pending and stand rejected. Claims 1, 14 and 15 are amended in this response. New claims 73-85 have been added. Applicants respectfully traverse the rejections as applied to the amended claims, and offer the following comments.

35 U.S.C. §102(b)

The Examiner rejected claim 1 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,852,391 to Ruch et al. The Ruch et al. patent discloses a non-tethered self-driven pipeline vehicle that may be segmented into several distinct non-tooling modules attached to one another in succession by ball joints.

Ruch et al. shows a self-driven pipeline vehicle having a sealing arrangement with the pipe and turbines that allow fluid flow through the vehicle body. This vehicle is illustrated in FIGS. 1 and 3, and described in column 3, lines 30-68 and column 4, lines 1-12. The vehicle has a programmable steering/control unit (22) for steering and controlling the unit. This vehicle has a coupling part (13), otherwise known as a socket, that connects with another coupling part (39) otherwise described as a ball joint. This connection (13 to 39) does not releasably nor electrically connect this vehicle to an interchangeable tooling module as claimed in amended claim 1 of the above captioned application. Further, this joint (13, 39) does not have electrical connection means, which is also claimed in amended claim 1.

yes it does

The opposite side of the single multi-function vehicle discloses a frame (15) having a replaceable coupling mechanism (15b) and a frame (15a). The frame (15a) is capable of being “employed to carry a metering instrument” and the coupling mechanism (15b) may connect “a shut-off device or a moveable body in the pipeline”. See column 4, lines 3-7. Although the frame (15a) and coupling mechanism (15b) are replaceable for one another, there is only one connection in which they may attach to the vehicle and thus, only one may be used at a time.

Ruch et al. does not disclose however, in this embodiment, any second flexible joint connected between interchangeable tooling modules as claimed in amended claim 1 of the above captioned application. Further, Ruch et al. does not even disclose, in this embodiment, any second flexible joint having electrical connection means electrically and releasably connecting to anything else as claimed by Applicants. Another missing element in this embodiment is that, although there may be provided one interchangeable module, there is not disclosed at least two interchangeable tooling modules in the same device.

The single multi-function vehicle, discussed above, can be divided into several distinct non-tooling modules linked together with flexible coupling parts (13) that are connected via a mechanical coupling part (39), otherwise known as a ball and socket joint. This embodiment is illustrated in FIG. 4 and described in column 4, lines 12-68 and column 5, lines 1-15. The segmented vehicle comprises a propelling module (14), a power supply module (50) and a control module (20), in this order. The control module (20) and the control unit (22) are the only two units disclosed as having electrical components. A coupling mechanism (15b) is only provided at the front of the segmented vehicle on the control module (20), which comprises a spring-loaded latch (7) secured by a displaceable sleeve (6). See FIGS. 2 and 4. The coupling mechanism (15b), of the segmented vehicle, is provided for coupling to one of a shut-off device, measuring instrument, metering instrument or possibly a moveable object in the pipe that has a coupling part (39). See column 4, lines 54-55 and column 5, lines 6-7.

Ruch et al. does not disclose, in this embodiment, like the previous embodiment, any second flexible joint connected between interchangeable tooling modules as claimed in amended claim 1 of the above captioned application. Ruch et al. also fails to teach in this embodiment any second flexible joint having electrical connection means electrically and releasably connecting to anything else as claimed by Applicants. Although the train of this embodiment has individual

modules linked together, they have a specific sequence and are disclosed as only operating in that sequence. These modules are not tooling modules, they are not taught as being interchangeable and they are not releasably connected as claimed in the above captioned application. Another missing element in this embodiment of Ruch et al. is that, although there may be provided one interchangeable module connected to the coupling mechanism (15b), there is not disclosed at least two interchangeable tooling modules in the same device.

Lastly, the Ruch et al. patent discloses a second hydraulically self-driven train illustrated in FIGS. 5-20 and described in column 5, lines 16-68 and columns 6-10. This train is comprised of four modules coupled to each other “via ball joints” (e.g. 55, 86). *See* column 5, lines 23-25 and lines 50-51. The four modules are comprised of the control module (20), the power supply module (50), a hydraulic power module (60), and a drive module (80) in that disclosed sequence. A coupling mechanism (30) is disclosed as being an additional attachment of the control module (20). *See* column 5, lines 34 and 61. The coupling mechanism (30) is also described as a separate attachment that is coupled to the ball joint (42) of control module (20). *See* column 6, lines 54-55. Control module (20) is the only module in the train disclosed as having the addition of a coupling mechanism (30) attached to it, which is positioned exclusively at the leading portion of the train. *See* FIGS. 5-7 and column 9, lines 50-54. Rescue pig 110 may also use the coupling mechanism (30) for retrieving a damaged transport vehicle. *See* column 10, lines 58-62. The coupling mechanism (30) is merely provided for hydraulically actuated remote controlled connections to and from “modules” that are to be transported into the pipeline and left there or otherwise are to be retrieved out of a pipeline. *See* column 5, lines 62-65 and column 6, lines 43-46.

Ruch et al. does not disclose in this last embodiment any second flexible joint connected between interchangeable tooling modules as claimed in amended claim 1. Ruch et al. does not teach any second flexible joint having electrical connection means electrically and releasably connecting to anything else as claimed by Applicants in the above captioned application. The train of this last embodiment has individual modules linked together, however, these modules have a specific sequence and purpose and only operate in the sequence disclosed. It is not possible to use “any other modules” in their place as suggested in the Office Action in a train configuration. Thus, these modules are not interchangeable and they are not releasably

connected as claimed in the above captioned application. Another missing element in this last embodiment of Ruch et al. is that there is not disclosed at least two interchangeable tooling modules in the same device, although there may be provided one interchangeable module connected to the coupling mechanism (30) only.

The control module (20) of the segmented module train embodiments and the control unit (22) of the vehicle are the only units disclosed as having any electrical components other than wires. The segmented modules of a train do not “talk” to one another because the control module (20) is the only unit equipped to transmit and receive information. As such, the modules are not able to “talk to one another” as suggested in the Office Action. In addition, these control modules/units (20/22) are disclosed as the only unit having a metering device. Thus, sensors cannot be provided “in various modules” as suggested in the Office Action.

The Office Action also cited “detachable joints” (30), which are actually disclosed as a separate attachment coupled to the ball joint (42) of the control module (20) on the train. The coupling mechanism (30) is more like another module, as described in column 10, lines 58-59, than it is a joint. If a module were to be connected to the coupling mechanism/module (30), the ball joint of the module to be connected would need to couple to the coupling mechanism/module (30). The other end of the coupling mechanism/module (30) is connected via a ball and socket joint as illustrated in FIGS. 7 and 19. The train modules disclosed in Ruch et al. are not “detachable” as suggested in the Office Action without employing a separate coupling mechanism/module (30).

Claim 1 of the above-referenced application has been amended to recite the second flexible joint in Applicants’ multi-module pipe repair inspection device that flexibly, electrically and releasably connects the interchangeable tooling modules. Applicants’ device, as recited in amended claim 1, is not anticipated by the Ruch et al. patent. Withdrawal of the rejection under 35 U.S.C. §102(b) is respectfully requested.

35 U.S.C. §103(a)

In the Office Action, claims 1, 12, and 14-20 were rejected under 35 U.S.C. §103(a) as being unpatentable, over the teachings of U.S. Patent No. 5,878,783 to Smart in view of U.S. Patent No. 5,899,795 to Penza and the patent to Ruch et al., discussed above. Claims 1, 12 and

14-20 were also rejected under 35 U.S.C. §103(a) as being obvious over Penza in view of Smart and Ruch et al.

MPEP §2143.03 requires that in order to establish a prima facie case of obviousness, “all the claim limitations must be taught or suggested by the prior art.” Further, “[i]f an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious.” *Id.*

Smart shows a pipeline vehicle having a train of modules connected by suspension modules (17). The suspension modules (17) allow flexibility of operation and are placed between each functional module. These modules are comprised of three spring loaded arms (30) terminating in wheels (31) and permit a rotating central shaft (33) to be positioned through the suspension module (17). The train includes a traction module (11), power module (12), manipulator module (13), sensor module (14), drill module (15) and a fusion module (16). The suspension modules (17) and the central shaft (33) are not releasable and are not capable of telescoping. Further, the modules (11-16) are not disclosed as being interchangeable. There is no teaching or suggestion in the Smart patent that the modules (11-16) are interchangeable or otherwise have joints that flexibly and releasably connect the modules to one another. Further, there is no disclosure of having two flexible joints that flexibly and releasably connect the modules as claimed in amended claim 1.

The Penza patent discloses a tubular structure having a centrifugal tool head that performs grinding, cleaning or polishing operations. The Penza device is not modular and therefore does not disclose or suggest interchangeable tooling modules or flexible and releasable joints between one of them and a base module, or between one of them and another tooling module, that would permit modules to be disconnected for interchanging with another module.

As explained above, Ruch et al. does not disclose or suggest at least two interchangeable tooling modules in a device, nor does it disclose releasable joint members connecting at least two interchangeable tooling modules. Ruch et al. merely discloses a train connected by fixed ball and socket joints (e.g. 55, 86) that are not releasable not are they interchangeable. Once assembled, the Ruch et al. patent does not disclose or teach how one would disconnect the modules of the train. The ball and socket joints taught in Ruch et al. are not capable of being released. Although a coupling mechanism/module (30) is taught, this singular structure only connects to an

unoccupied ball joint. Thus, a minimum three-part train would be the smallest unit capable for connection to a single piece of "equipment" to be left in the pipeline or retrieved from the pipeline, such as a shut-off valve. Further, there is only one manner known in which the coupling mechanism/module (30) can be released, that being only with hydraulic assistance.

Further, MPEP §2145 states that "[a] prior reference that 'teaches away' from the claimed invention is a significant factor to be considered in determining obviousness". In the preferred embodiment disclosed, and other embodiments, the configuration of the modules is specifically delineated and illustrated as being "advantageously placed" in succession from the drive module (80) back to the control module (20). Col. 5, lines 38-49. The drive module (80) is "preferably" placed next to the launching site for braking purposes and provides the "most stable transportation" in vertical parts of the pipeline. The only order of modules taught is listed in the Ruch et al. patent and follows from the drive module (80) to the hydraulic power module (60), to the power module (50) and then to the control module (20). Although Ruch et al. suggests connecting additional equipment to the end of the train, the disclosure teaches away from having interchangeable modules.

In Ruch et al., if the modules were interchanged as proposed in the Office Action, the train disclosed would become unsatisfactory for its intended purpose. *See* MPEP §2143.01. The joints between the modules of the trains are not all equipped with the proper electrical and hydraulic connection means to be able to interchange with one another. As mentioned above, the drive module (80) is "preferably" placed next to the launching site for braking purposes and provides the "most stable transportation" in vertical parts of the pipeline. If the drive module (80) were repositioned, Ruch et al. would not be satisfactorily arranged for its intended purpose of braking and providing stable transportation. Thus, if the proposed modification were to be attempted, this device would be rendered inoperable and unsatisfactory for its intended purpose.

In addition to the amendment to claim 1, as discussed above, claims 14 and 15 have been amended to state that a second flexible joint releasably connects the interchangeable modules. Claims 12 and 14-20 depend from claim 1, and therefore include all of the limitations of claim 1. Basis for the amendment to claim 1 can be found, for example, in the Specification at page 11, lines 7-14. Support for amendment to claims 14 and 15 and the addition of new claims 73-85,

further defining the combination of modules and their associated components, can be found throughout the Specification and in the drawings.

All limitations of the device recited in amended claim 1, and claims 12 and 14-20 is not shown or described in, nor suggested by, the combined teachings of the Ruch et al., Smart and the Penza references. The claimed invention is thus not obvious in view of the combination of the cited references. Withdrawal of the rejections under 35 U.S.C. §103 is respectfully requested.


CONCLUSION

Applicants have made every effort to be fully responsive to the Office Action. Claims 1, 12 and 14-20, as amended, recite a novel and nonobvious device. Reconsideration and allowance of claims 1, 12 and 14-20 are requested. If the Examiner finds claim 1 to be allowable, applicants request consideration of the claims previously withdrawn from consideration.

Applicants hereby petition for a one-month extension of time. If additional time is required, please consider this a petition therefore. The PTO is authorized to charge Deposit Account No. 11-1110 for the fees associated with this petition and any other fees associated with this Amendment.

If the undersigned can be of assistance to the Examiner in advancing the application to allowance, the Examiner is encouraged to contact the undersigned at the number set forth below.

Respectfully submitted,


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MARKED VERSION TO SHOW CHANGES

In the Specification:

The paragraph set forth on page 20, lines 6-15 has been amended as follows:

-- FIG 16 illustrates a schematic of the functional components of the marker module 38. The marker module 38 applies a marker, such as, for example, a stripe of paint, circumferentially around the inside of a pipe at a fixed distance from the detected flaws. The module 38 includes a reservoir tank 56 pressurized to, for example, 20 psi by an on board gas source 58. The gas can be, for example, nitrogen stored at, for example, 300 psi[and a miniature]. A non-relieving regulator 60 drops the pressure to, for example, 20 psi above the ambient pressure of the material within the pipe. The regulator 60 is set through an access port prior to the device 10 being inserted into the pipe. The gas in the gas source 58 can be filled through a charge port 61 and the reservoir tank 56 can be filled through a fill and vent port 63. A check valve 59 prevents backflow from the gas source 58. --

In the Claims:

1. (Three Times Amended) A multi-module pipe repair inspection device, comprising:
 - a base module;
 - a microprocessor;
 - at least two interchangeable tooling modules;
 - [at least one] a first flexible joint having electrical connection means, said joint flexibly, electrically and releasably connecting the base module to a selected one of the interchangeable tooling modules; and,
 - a second flexible joint having electrical connection means, said joint flexibly, electrically and releasably connected between the interchangeable tooling modules.

14. (Twice Amended) The device of claim 1, [12, further comprising a second flexible joint flexibly, electrically and releasably connected between the sensor module and the brush module.]
wherein each of said first and second joints is comprised of end portions, a spring positioned between said end portions defining a passage therethrough, and a flexible wire for electrically

interconnecting adjacent modules to pass control and feedback signals from one module to another.

15. (Three Times Amended) The device of claim 12, further comprising an interchangeable locomotor module connected between the base module and the sensor module by additional flexible joints.